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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

BRANCH OF RESEARCH

MONTHLY REPORT

OF

FOREST EXPERIMENT STATIONS
FOREST PRODUCTS
FOREST ECONOMICS
RANGE RESEARCH

JUN 1932

M—5105

U. S. GOVERNMENT PRINTING OFFICE: 1929

8—74.17a

BRANCH OF RESEARCH

June 1931

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FOREST EXPERIMENT STATIONS

ALLEGHENY FOREST EXPERIMENT STATION

General

The emergency construction program and the revision of the Capper Report data have so monopolized our time that everything else has suffered.

The low bid for the construction of a resident superintendent's house and a field house for visiting members of the staff, together with natural gas, water, and sewage connections, has now been accepted, and the contracts were signed by the Secretary late in June. In April, when the well-drillers had reached a depth of 144 feet, and struck water estimated to flow at the rate of 300 gallons per hour, Hough suggested that they continue to 150 feet. To his great satisfaction the extra six feet nearly tripled the quantity of water obtainable from the well, bringing it to 850 gallons per hour, with water standing in the well at a depth of 65 feet.

Revision of the Capper Report figures took practically all of Forbes' times from the middle of April until the middle of June. In this work he had the assistance of Wood in the early planning, of Schnur in the computation of drain figures for such products as mine props, cordwood, etc., of Morey in compiling growth per cents from yield tables, and Hough in assembling National Forest statistics.

Thanks to the cleverness of those most directly involved, and to the absorption of the rest of us in all of these jobs, Julia Pruitt and Luther Schnur took the staff very much by surprise when they left on June 4 to be married in Erie, Pennsylvania, by Schnur's father.

Late in May Dr. True of the University, confirming an earlier tentative arrangement, authorized us to begin at once to move into a second laboratory in McFarlane Hall. The purchase of a considerable and varied equipment had badly overcrowded the first-floor laboratory long ago assigned to our use, and the additional space, a laboratory in the northwest corner of the basement, will be extremely welcome. Although it is out of the question for the University to grant us exclusive use of this room, we do not expect that our occupancy will be seriously disturbed. Dr. True has also assigned us more satisfactory greenhouse space than we have hitherto had.

Wood has been putting on permanent record cards all of the data for 99 distinct subdivisions of our 320 acres at Camp Ockanickon. The variation in this mixed pine and hardwood forest may be judged from our recognition of 16 distinct cover types or sub-types, and 7 ten-year age classes. The data placed on the card for each sub-division include area,

cover type, age of stand, volume, history, soil, and other details. Most of these data are already in our files; Wood has just completed a check of the type map.

In order to save himself from succumbing to that dread malady "statisticitis" (try to pronounce it!), Forbes temporarily deserted his Forms 1 to 4, and attended the June meetings at State College, Pennsylvania, of the American Botanical Society and of the Pennsylvania Forestry Association. He spoke before the latter on the scientific value of virgin timber areas. He found many of the botanists interested in the problems of forest ecology if not of silviculture, and felt extremely well repaid for meeting with them. Among several worth-while ideas which he picked up at the meeting, was a plausible theory as to why pitch pine, which we have always regarded as an extremely drought-resistant species, should have been particularly sensitive to last summer's drought; on many hillsides in central Pennsylvania it has been killed, while its hardwood associates have survived. Dr. Gress, State Botanist of Pennsylvania, says that the hardwoods quite early in the drouth were probably able to escape excessive transpiration by dropping a substantial portion of their foliage. The pines, the needles of which do not wilt as rapidly, continued to transpire until available soil moisture was completely exhausted, and when the drought continued the trees were bound to die. Forbes has turned this idea over to the type committee of the Allegheny Section, which is temporarily out of a job, and which is quite logically concerned with anything affecting forest composition. Forbes is suggesting to the committee that it might test Dr. Gress' theory by tallying the living and dead trees on typical areas by vigor classes. It seems likely that the mortality rate among the vigorous trees would be at least as high among the unthrifty ones.

The scant time as Forbes has been able to spare for Allegheny Section affairs he has given to the selection of a rather large number of committees, through the work of which he believes the Section may become a vital thing instead of an organization meeting perfunctorily a couple of times each year. He has appointed Hough to his own place on the type committee, and Jackson to a standing committee on forest insects and diseases which will endeavor to make systematic observations and compile records of the occurrence of these forest enemies throughout our territory.

Morey has brought up to date our distribution maps for the chief species in our territory, by putting on paper all of the observations we have yet made.

Supervisor Bishop of the Allegheny Forest met the Director at Kane, to decide on the ground the best location for the boundaries of the Experimental Forest. These will be surveyed and adequately marked early in the summer. The main haul road through the tract, which has been constructed from the emergency fund with some help from the

National Forest, has been very satisfactorily relocated by Supervisor Bishop's forces, and in time will make a most serviceable road not only for hauling out forest products but for general communication between Dahoga and Lamont.

Forestation

Wood planted a total of 3869 tree seedlings at Camp Ockanickon this spring. Of these 1568 were replacements. The remaining 2301 seedlings were planted over 25 4/10 acres, or at the rate of only 91 trees per acre. The 1930 plantings averaged 192 trees per acre. The smaller number per acre used in 1931 was a result of the changing topography, which in turn changes the cover conditions of the planting site; the 1931 planting sites become increasingly lower and already support a better forest stand. Cursory examination in June of this year's plantings show a good survival for all species except the loblolly and shortleaf pine received from the State of New Jersey. This stock had again suffered frost injury in the nursery at Washington Crossing and in spite of culling before planting many of the planted trees were weak. Survival among the thousand Japanese chestnut seedlings, planted jointly by Wood and Jackson, seems to be zero. Had the survival per cent been 100 we would still be curious to know what practical purpose is served by planting chestnut of any species in a region where chestnut did not originally grow. Have we substantial reason to believe that the entire genus Castanea possesses the virtues of the American chestnut, and even if it did, would not the money spent in scouring the world for blight-resistant species be much more profitably employed in a study of our native genera of trees, which we know beyond any doubt will grow under our climatic conditions?

Rodents continue to wage an unrelenting warfare against the trees at Camp Ockanickon. A June count of the 1930 plantations shows that almost half of the white pines which were alive in September of the previous year were destroyed over winter by rabbits. About one-fourth of the jack pine were similarly destroyed. The other planted species suffered less, but the survival per cents this year were only as follows: shortleaf pine, 37; jack pine, 43; white pine, 55; pitch pine, 68; and red pine, 85. The survival percentage for all species was reduced from 63 3/10 per cent in September to 54 per cent in April.

Management

Our studies of natural reproduction at Camp Ockanickon suffered a severe setback in the disturbance of our chestnut oak seed traps by unknown persons during the winter. On opening the traps this spring Wood found that only a single germinated acorn remained in one trap out of a total of 938 counted last fall. In the other trap there was no trace at

all of the 38 acorns counted in the fall. Someone walking on the wire had separated it at one point from the tree, and although Wood had repaired the wire where it pulled loose from the boards on the periphery of the trap, he did not see the hole at the tree.

Mensuration

Schnur made some changes in his two manuscripts on the converting factor study, in order to meet the comments of the Branch. He and Professor A. C. McIntyre of Pennsylvania State College have completed a short manuscript entitled "The Measurement of Mine Props". Although the methods of making up these tables were devised jointly by McIntyre and Schnur, the bulk of the field work was done by State College. We are therefore well satisfied to have the article appear as a bulletin of the Pennsylvania Agricultural Experiment Station, and Forbes was very much pleased to have Director Fletcher of the Pennsylvania Station refer to it at some length in his address to the Pennsylvania Forestry Association. Dr. Fletcher described it as the first fruits of a spirit of cordial cooperation existing between the two experiment stations.

Schnur has begun the very large job of analyzing the twenty-five-year records on the loblolly pine plots in Maryland. Only a more thorough acquaintance with the data than we now have will enable us to say how the information can be most fruitfully used. One thing is certain: that a tremendous amount of computation will be necessary.

Mycorrhiza

Hatch and Doak commenced their field work in earnest on this project early in May. After a rather thorough preparation, which included copying a good many records of plantations and sample plots, established by the States in our territory, the men spent several days on the Eastern Shore of Maryland, in northern and central New Jersey, and in the northeastern portion of Pennsylvania. Hatch's comments on the plantation records at Harrisburg is that they are "in excellent condition", and the cooperation which we have received from all the State departments of forestry could not be improved upon. However, there are evidently a few skeptics in these organizations who seem hardly to realize the value of such abstruse studies as those of fungi on the roots of trees. After much consultation with the Laboratory engineer, Hatch feels that a workable arrangement has been made for cooling as well as aerating the projected pure culture experiments at the Boyce Thompson Institute in Yonkers. The problem of cooling the atmosphere in his sterile flasks, which will contain both tree seedlings and fungi, has apparently been solved by tapping the air of the cellar underneath the greenhouses. Even with generous aid from Dr. Crocker and his associates, the work at the Institute promises to be quite costly, and we are bound to run into difficulties in the technique. Hatch has been testing the water-holding capacity of different types of sands which he will use in the flasks, and has done a good deal of laboratory work in all phases of the mycorrhiza study.

Even such enthusiastic searchers for mycorrhiza as Doak and Hatch have been astonished to find how widely mycorrhiza are distributed in our territory, and on how large a number of tree hosts. In fact the only tree or shrub species which they have so far found to be free of mycorrhiza is the very insignificant Canada yew. Their collection of sporophores of fungi suspected of forming mycorrhiza is increasing by leaps and bounds, and presents the expected puzzling problem of identification.

Mr. Doak became Dr. Doak at Purdue University early in June.

Pathology

Field work on the decay of sprout hardwoods is in progress. To date Jackson has made a preliminary survey of northern New Jersey for the purpose of locating sprout stands which have not been injured by fire. Observations are being made also on forest tree diseases in general.

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APPALACHIAN FOREST EXPERIMENT STATION

General

The seventh meeting of the Appalachian Forest Research Council was held at Asheville June 2. It was immediately followed by the three-day sessions of the American Forestry Association. This combination of meetings made a very busy period for nearly all members of the Station.

The Council meeting was attended by twelve Council members. The first part of the program was a review of the years' progress and future plans for the Station's major investigative projects, presented by the men in charge. Proposed new lines of investigation were discussed by Hursh, who told of the plans for the streamflow and erosion project, and by Frothingham, who discussed needed extensions of research in other directions. The latter talk was illustrated by a chart showing actual as compared with authorized allotments under the McSweeney-McNary Act.

The program also included the following addresses:

Pending research on forest fire weather by the U. S. Weather Bureau - E. B. Calvert, Chief of the Forecasting Division, U. S. Weather Bureau.

Streamflow and erosion - H. H. Bennett, in charge soil erosion investigations, Bureau of Chemistry and Soils, and E. D. Burchard, U. S. Geological Survey.

Research and the administration of Southern Appalachian national forests - J. G. Kircher, Regional Forester, Region 7.

Status of land acquisition for the Smoky Mountain National Park - Verne Rhoades, Secretary, North Carolina Park Commission.

Forest Biology - W. B. Bell and Lisle Morrison, U. S. Biological Survey.

The Dutch elm disease - R, W. Leiby, North Carolina State Entomologist.

Forestry at Duke University - C. F. Korstian, Director of Duke Forest.

Forest investigations by State Foresters - H. S. Newins (West Virginia), J. S. Holmes (North Carolina), B. M. Lufburrow (Georgia), H. A. Smith (South Carolina), and J. O. Hazard (Tennessee).

Eight resolutions were passed relating to the work of the Station.

For the American Forestry Association meeting the Station prepared an exhibit, one feature of which was a series of forest litter samples taken from stands in the Bent Creek Forest. This showed the beneficial effect of a mixture of hardwoods in pine stands and the steps in the deterioration of the litter under a pine-oak stand subjected to burning. A map of the Station territory showing all points where work is being done, sections from a fast growing yellow poplar, and from fire damaged oaks; and a set-up for injecting pines with poison solution to kill dendroctonus beetles were also on display. Members of the staff led a field trip through the Biltmore Estate and accompanied members of the Association on other excursions through the forest about Asheville.

At the invitation of Region 7, five forest school professors and as many Forest Service men gathered in Asheville on June 22 for a three-day trip through Pisgah National Forest. The first day the work of the Station was reviewed on the Biltmore Estate and at Bent Creek. Sims, Buell, and Frothingham accompanied the party to Mount Pisgah that night and through the Pink Beds next day. Public camp grounds were inspected, the Station's yellow poplar disengagement plots at Lookingglass Rock were visited, the management of deer on that district of the forest, which is a Federal game preserve, was discussed, and pens where captured fawns are reared for shipment were examined. At the Lookingglass Rock sample plots, where a cutting to release yellow poplar reproduction from competition was made in 1923, it was found that the subsequent death of the chestnut on the untreated plots has resulted in a natural release for the yellow poplar on them, thus partially nullifying the experiment.

The Mount Mitchell District of the forest was visited on the third day. The possibilities of good silviculture where markets are

right was illustrated by one sale area where sawtimber was first cut, then a sale of pulpwood was made, and now the tops and undesirable trees of small size are being removed for fire wood. At another point, sale area betterment work was in progress. Here large wolf trees, left by the logger, were being girdled, and smaller trees of undesirable species or form were being cut. This trip included visits to an area of virgin yellow poplar, white oak and hemlock which has been proposed for a natural area, and to a splendid stand of reproduction which has grown up during ten years of strict fire control since a heavy Forest Service cutting.

The trip is the third of its kind that has been initiated by Region 7 for the purpose of showing to the forest schools the training required for work in the region.

For use in a proposed series of short articles relating to the streamflow-erosion project, Abell spent June 19 to 25 photographing examples of devastation following the removal of forest in southwestern North Carolina and southeastern Tennessee. A large group of pictures showing the results of fume damage were made in the region about Ducktown, Tenn., and other views were taken of gullies following clearing for agriculture.

Forest Management in North Georgia

Barrett completed the manuscript of an establishment report outlining permanent quadrat work done to study the seeding in and establishment of Virginia pine on a cut-over hardwood area. The experiment will have particular bearing on the ability of this pine to compete with sprout hardwood reproduction.

Page proof of the poplar bulletin "Forests of Georgia Highlands" was received from the Georgia Forest Service. This was reviewed and returned for publication. The authors are Hursh and Barrett.

Forest Entomology

During June Ralph Caird (Univ. Michigan, N. D.) Wygant, (Purdue Univ.) and L. W. Peterson (Univ. Minnesota) reported for duty to assist in a study of southern pine beetle problems. R. A. St. George, in charge of the work, reports a scarcity of southern pine beetles, (Dendroctonus frontalis) in the vicinity of Asheville for the spring months. There was a super-abundance of this insect last fall and it is believed that the great reduction in numbers may be partly due to the work of certain birds, particularly the hairy woodpecker and to a late fall emergence of a brood which would normally be dormant until spring. Unusually warm weather during October and again during the last half of November may

have brought about this abnormal emergence. The broods resulting from attacks of beetles from this late emergence were unsuccessful. Adults, eggs, and tiny larvae in newly attacked trees were found dead this spring. The trees appeared to be in an unusually moist condition. The woodpeckers were probably responsible for the reduction of the largest number of the beetles since they had stripped the bark from nearly every tree to get the brood. There has not been an opportunity as yet to determine whether or not the scarcity of beetles is general.

Huckenpahler has just finished the field data to determine the depletion in pine stands on the experimental unit caused by the southern pine beetle during the past ten years.

St. George and Huckenpahler have begun a study of the relative rates of drying of felled and girdled trees. The object is to discover the method most effective in reducing the attacks of ambrosia beetles on logs. Yellow poplar is being used at present.

Experiments in injecting live pines with poisons to kill broods of Dendroctonus and to prevent subsequent attack of other insects are being continued. Freshly cut logs are being sprayed with the same chemicals used in the injection work in order to compare the effectiveness of the two methods of treatment in preserving the wood from destruction by wood-boring insects and decay. The object of another experiment, in which standing hickory and pine trees are injected with poisons, is to render the trees safe from insects and fungi so that freshly cut trees may be used immediately for rustic purposes where it is desired to leave the bark on the logs. Such material would be used for the construction of cabins, rustic bridges, and the manufacture of rustic furniture.

Forest Pathology

Chester Phelps (N.C. State College) who worked with the Station last summer, reported to Nelson for summer work in forest pathology. Since his arrival he has been making measurements of chestnut sprouts in an experiment which compares the growth and blight resistance of single and multiple sprouts, and mapping the plantations of oriental chestnut at Bent Creek.

Nelson went to Sumter, S. C., on June 29 at the request of the forester for the Statesburgh Nurseries, where observations were made on damping off and drought injury.

Forest Biology

Burleigh spent the last two weeks of June in West Virginig, making a preliminary survey of wild life in the vicinity of Parsons.

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CALIFORNIA FOREST EXPERIMENT STATION

General

Papers were presented by both Kraebel and Lowdermilk at the meeting of the American Association for the Advancement of Science, held at Pasadena, California, during the week of June 15-22. That by Kraebel was on "The relation of chaparral succession to the water problem in southern California". Lowdermilk presented two papers, on "Erosion pavement, its formation and significance" and "Certain aspects of the management of watersheds for yield of water".

Mr. F. L. Conner, the new Executive Assistant for the Station, arrived in early June and is rapidly digging in the Station organization and work.

Forest Management - Pine Region

At the Stanislaus Branch, Loyd continued measurements of current height and diameter growth of the important timber species.

Two instrument stations were installed in conjunction with the natural reproduction study - one in a clear cut area, the other on a Forest Service sale in the sugar pine - fir type.

Hasel and Clement have practically completed remapping the reproduction quadrats at the Stanislaus Branch.

Making both ends meet on improvement money at the Stanislaus and Feather River branches took much of Dunning's time. Fences, fire lines, water system, and buildings were completed except for the usual loose ends that could not be finished by June 30.

Dunning made a trip to the Lassen with Doctor Bodman of the Soil Technology department of the University of California to describe the vegetation about six sampling stations where preliminary work is being done on forest soils.

Forest Management - Redwood Region

The first week of June was spent on a preliminary analysis of the data that have been collected on planted areas in the redwood region. The remainder of the month was spent in Humboldt and Mendocino counties in completing the field work on the planting study and also in determining what material in the nature of maps and history is available for use in an extensive survey of some of the redwood cut over areas.

Most of the planted areas have now been visited and data on number of trees and acreages planted by years have been obtained from the lumber companies which participated in the planting project. Data on the time between logging and planting, the fire history and other pertinent data were also obtained where available.

A number of the redwood operators were interviewed, including A. S. Murphy, president of the Pacific Lumber Company, J. A. Rankin, general manager of the Hammond-Little River Redwood Company, P. J. Rutledge, manager of the Dolbeer-Carson Lumber Company, and Howard Dessert, of the Dessert Redwood Company. The cooperation of all of these companies has been offered, in particular the use of maps and records and locations for field headquarters and experiments.

Cover Types

The mapping of two distinct units was completed during the month, (1) the Techachapi Mountains, and (2) Santa Barbara County. These areas are contiguous to southern California, and mapping of which was completed last winter. The crew in the first area moved north into areas adjacent to the Sequoia National Forest and the second crew has moved to Eldorado County.

The first field work on the cover type project was initiated in this county by Howard Siggins and Wieslander in 1926, the work being done extensively and rapidly, an average of a township being mapped a day. The area is now to be remapped to present more intensive standards because Professor David Weeks of the Giannini Foundation, University of California, is making a land use study of the county and the Experiment Station is to cooperate on the timber phase. Wieslander spent nearly two weeks starting out the crew. In addition to types, cut-over lands and burns are being graded according to stocking and sites are being mapped.

With respect to site a real problem was encountered. The stands have been repeatedly culled over since the early mining days and the heights of mature trees left are not indicative of the site. Accordingly, site index, based on age-height of dominants in second growth stands was determined. But no correlation between this site index and the standard site classification on mature heights has been worked out. Reineke has been assigned to the problem and in this connection will make a trip with Wieslander early in July to Eldorado and Siskiyou counties.

Cooperation with U. S. Geological Survey

Wieslander worked up instructions for the U. S. Geological Survey so that their topographers will map major types, such as timber, brush,

woodland, grass, and cultivated areas on a tracing overlay on their field topographic maps. Last year they attempted to map the detailed types but were not very successful because boundaries of many of the timber types are not easily distinguishable. The boundaries of the types worked out for them this year are obvious on the ground and their accurate delineation on the U. S. Geological Survey quadrangles will enable a more rapid covering of the area later when data on sites, subtypes, and species are secured. Wieslander will accompany T. R. Littlefield, Chief of Maps and Surveys of the Regional Office, on a trip during July to explain the types on the ground to the U. S. Geological Survey topographers. Four 30-minute quadrangles located in Siskiyou, Shasta, and Trinity counties are to be mapped by the U. S. Geological Survey this season.

Influences

Brush Tanks

The two batteries of large lysimeters, each with 5 compartments, have been installed in Stawberry Canyon near Berkeley. A total of 160 tons of soil was carefully handled in shallow layers in excavation and returned to the lysimeters. Thirty-five tons of soil were sampled in the Sierra foothills and transported to Berkeley to furnish a soil of widely different textural characteristics for comparative experimentation. Run-off and seepage collector tanks are so designed that 0.1 inch depth in the collector tank represents 0.004 inch depth in the lysimeters. This installation has been put in to last not less than 50 years and it is expected that valuable information on the role of brush vegetation in yield of water will be derived from the manipulations to be carried out at this installation.

Dam in Devil Canyon

The construction of a core wall dam to bed rock into the cobble fill of a tributary to Devil Canyon has required much of Lowdermilk's personal attention. A number of problems have arisen, which prepare us for the construction of the controls for the duplicate watershed studies. A departure in the Venturi or Parshall flume as improved by Parshall has been made in changing the slope of the floor of the diverging downstream walls from a reverse slope of 6" in 3 feet to a downstream slope of 3" in 3 feet. It is hoped to have ratings made of this type of flume, which is considered to be more satisfactory for measuring debris laden waters of mountain streams than the present form of flume, which was designed primarily for the measurement of water in irrigation canals.

The purpose of this installation is to determine the amount of mountain stream flow which is lost through evaporation and chiefly through the transpiration of riparian vegetation of alders. Water has

a value of $2000 a miner's inch (southern California) of constant flow, or $100,000 a second foot for municipal use in San Bernardino County. It has already been found by measurement that the diurnal oscillations in flow are surprisingly large. In some instances the streamflow is now piped out of canyons, whereupon the alder trees die off promptly. It is the object of the study to discover the value of water that is being transpired and lost into southern California skies during the summers. This dam will make possible the collection of data on this question.

Fire research

Visibility Study

Work was continued during the first half of the month on field visibility mapping of the east half of the Shasta Experimental Fire Forest. Additional checks were made, by field inspection, of points mapped by the profile method. For three points so checked, the total error was 6%, 7%, and 10% respectively. This includes the areas which are not actually seen but shown as seen on the profile map, and also the areas which are seen but not shown as seen on the profile map. In general the additions were greater than the subtractions. The main difference lay in narrow strips around the edges of zones of seen area, although some areas which appeared as blind on the profile were actually seen. This was due to the point of observation having an elevation greater than the last contour shown on the topographic map. The corrections necessary while not great show that the peaks should be occupied. This entails little extra work, since the physical conditions such as timber which must be cut, foundation material, road, trail and telephone possibilities and costs must be noted and require actual examination of the lookout site.

The relief model of the west side of the Shasta Forest has been completed and a copy received at Mount Shasta. The model has aided materially in checking visibility and comparison of points by using the light and shadow method. Several visibility maps prepared by the field method have been compared with the visibility shown by the light and shadow method. The seen areas appear to check in shape and size very closely. At a later date maps will be drawn from the relief model and the percentage of difference determined accurately by checking these maps against the field sketching.

A composite visibility map for all the points occupied in the Sacramento Canyon Unit has been prepared for use in checking lookout performance on fires which occur during the fire season. This composite map shows the area seen by three or more lookouts in blue, the area seen by two lookouts in red, and that seen by one lookout only in yellow, with blind areas left uncolored. When a fire is reported the dispatcher locates it on his map, determines which lookouts should see the fire. If the lookouts have not reported they are called, this fact being recorded on the lookout check form provided, with the reason for the failure of the lookouts concerned.

The Liaison Committee on the Shasta Experimental Fire Forest met at Mount Shasta from June 15 to June 19, inclusive. Those in attendance were Forest Inspector Loveridge, Regional Forester Show, Director Kotok, Assistant Regional Foresters Stockdale, Brundage, and Price, Regional Forest Inspector Pitchlynn, Supervisor Jones, Assistant Supervisor Nelson, R. E. McArdle of the Pacific Northwest Forest Experiment Station, Gowen, Curry, and Brown of the California Forest Experiment Station.

The program of work included a review of the fire record of the Shasta National Forest as given in the Fire Atlas Record. The projects set up in the Fire Research Working Plans were reviewed and discussed with recommendations for additional data required. The work done thus far along lines of visibility was exhibited, described in detail, and discussion carried on.

Motor trips were made covering two and one-half days for the purpose of giving each member of the Committee first-hand knowledge of the cover conditions (hazard), topography, location of protective organization, the risk areas, the general location of the lookout peaks, and the standards, number and location of the motorways and fire lines in the Experimental area. The whole area was traversed and a very representative cross section obtained of the problems which exist.

An interesting period was spent in watching a demonstration of a thirty Cletrac Bulldozer. In addition to the blade, heavy steel teeth were bolted to the lower edge at 12-inch intervals and extending down below the blade about 8 inches. The trial fire line was built in dense white thorn, manzanita, oak about 5 to 6 feet high, with some western yellow pine poles. A line 5 to 6 feet wide was built. There were some delays due to the unevenness of the ground surface. However, including all delays 18 chains of line were built in 31 minutes. This is probably a little better time than could be expected in actual fire control work. An estimate of 12 chains an hour in this brush type is considered conservative. On one fire where the bulldozer was used without the teeth on the blade 32 chains were built in 3 hours. The teeth give a much cleaner job and speeds up line building due to its rooting ability.

Products

White Fir Project

Brundage completed his part of the white fir bulletin and sent the manuscript to Madison, where R. P. A. Johnson, co-author, will assemble the final draft. In this one of the series of publications for the consumer on "little used" species, special emphasis will be placed on the silvicultural importance of white fir. To tell the public they should use more white fir simply because it is highly desirable to cut the species heavily when the virgin stands in the white fir types are

harvested would be, of itself, both nonsensical and futile as a remedy for the deplorable, run-down condition of the present white fir market, but as a supplement to the recommendation for using fir based on its intrinsic merits for specific purposes it may be helpful in promoting a better demand.

Prejudice against the species can only be broken down by providing consumers with a properly seasoned, well manufactured product and by education regarding proper use. The bulletin will endeavor to take care of the second part but the producer must adopt some radical changes in past policies before the first requirement will be realized, especially in connection with the seasoning of material sold locally.

Woods and Mill

Substantial progress was made in the Pickering woods and mill study computations. A considerable amount of time was spent in balancing the mill and overrun percentage curves of the completed trees in the study as against the same curves for mill run logs. As a check, the log overrun was applied to the constituent logs of the completed trees, and the tree overrun secured in this manner was compared with the overrun curve drawn from the actual overrun of the same group of trees. This procedure has proved a valuable check and led to some important modifications of the original tree and overrun curves in certain species. For small trees this check is of little value as the small logs in a mill run are made up of the logs of small trees and the top logs of large trees. The characteristics of these two groups are quite dissimilar. Previously, we had computed overrun for logs by log grades and for trees by tree classes with unsatisfactory results. While there is good reason to expect some significant differences in overrun for various log grade and tree class groups, the number of samples required to adequately determine such differences seems to be very large. However, a simple division of logs under 20" into two groups, namely, top logs from trees approximately larger than 32" and logs from small trees would be of considerable value in figuring log and tree overrun for this region.

Work has gone ahead also on the final tabulations of logging costs for logs and trees as well as the three-year average selling prices for use in the study.

Consulting Entomologist

The study of the white fir engraver beetle is being continued this season near the California Forest Experiment Station base at Strawberry. Struble started the field work here June 8. The work this season will be directed toward completing the life history data and determining the role of the fungus which is always associated with the attack of the beetle. Wagener and Wright of the Office of Forest Pathology are planning to work

out the latter phase of the study, and Wright will spend some time with Struble during the season. Experimental control measures for the fir engraver will also be tried out.

The regional survey party under Dr. Salman continued its work on the Modoc Forest during the month. Control work on the Devil's Garden experimental area was completed and three permanent sample plots were established and tagged. Salman reports that on the fringe type of western yellow pine on the Modoc the western pine beetle has been increasing, but that in the main timber belt the infestation is normal in spite of the deficient precipitation for the past two seasons.

Jeffrey is now concentrating his work at the Berkeley Laboratory on the nutritional requirements of the western pine beetle. A supply of freshly-attacked logs containing the egg state of the beetle was recently brought in from the Stanislaus Forest, and is being kept in the University cold storage room to be used as the laboratory work proceeds.

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CENTRAL STATES FOREST EXPERIMENT STATION

General

Summer field work of the station was actively begun on June 15th when four temporary employees reported to the station. Two others began work on July 1. Field work, thus far, has been largely limited to Ohio in two of the station's projects and to Indiana in the third.

The following is a corrected list of members attending the Central States Forest Research Council meeting at St. Louis on May 26th:

C. Vivian Anderson	E. E. Pershall
Frederick Dunlap	Edmund Secrest
R. T. Houk	E. N. Transeau
E. F. McCarthy	Wm. Trelease
R. B. Miller	R. F. Wilcox

A bulletin on "Yellow Poplar, its Characteristics, Growth and Management" was revised and transmitted to Washington during the month.

In the May report, attention was called to the serious condition of sycamore trees as the result of attack by the Sycamore Blight. These trees already show material recovery during the past month, since many new shoots have developed from larger branches below the infected wood. The lack of evidence of wilting of leaves indicates that there has been a cessation of the disease in cankers on small twigs. The amount of infected wood in sycamore trees is so great, however, that there is a good prospect of continued damage next spring.

Plantation Study Fp-1

L. F. Kellogg personally conducted a field party on yield of Black Locust plantation during the last half of the month. While a large number of plantations were inspected, damage by the locust borer had rendered many of them uneven-aged in character due to the killing back and sprouting of planted trees. Fifteen plots were measured in Ohio, the method of measurement being very similar to that previously used by Kellogg in his study of Black Walnut plantations. In the locust study, however, detailed records are being made of the locust borer infestation in cooperation of the Bureau of Etomology and soil samples are being taken to determine the extent of nitrogen fixation thru bacterial agencies.

It is the plan of the station to complete the study of locust yield in one season. For computation of yield on the plots, volume tables applicable to planted stands will be required. The station is very anxious to locate plantations in which cutting may be done during the summer or by early fall. In case cutting in locust can not be found, a field party will be equipped to climb locust trees in order to obtain these measurements.

Woodland Grazing Project Pa-1

General

Day, DenUyl, and Diller, during the last two weeks in June examined a number of areas in northern Indiana suitable for permanent sample plot studies. Approximately thirty plots, covering a wide range of conditions were selected for establishment during the present field season. Diller will have charge of this work, but will be given close supervision by both Day and Den Uyl. John Baker, a recent graduate of Purdue, will assist Diller.

Three of these permanent plots were established during the last week in June. W. R. Chapline, in charge of Grazing Research in the Washington Office visited the field party from June 30 to July 2. He is particularly interested in the carrying capacity study at the Pinney Purdue Farm, and offered a number of pertinent suggestions which should materially increase the value of the experiment. Dr. Stanley Cain, who is handling certain ecological phases of the study, was also present and received the benefit of Chapline's experience in similar studies.

Livestock Management Phase

The second monthly weighings of the three groups of steer in the Pinney Purdue tract was made on July 1. The three animals in the eighteen

acre tract are still in excellent condition and have shown a slight gain during the month. The three in the twelve acre tract do not appear to be in as good a condition as they were on June 1, but have also shown a slight gain. The three animals in the six acre tract have about held their own. These animals have been given intermediate weekly weighings during the last month their weights fluctuating back and forth with no definite trend in either direction.

The animals in the six acre tract will be weighed weekly during July and those in the twelve acre tract bi-weekly.

All grass forage has been completely utilized in all three tracts. Black cherry and shagbark hickory, the two principal species of tree reproduction have probably been utilized to better than 90 per cent in all three tracts. Blackberry, which is the most prominent vegetation species on the entire three tracts has been almost completely utilized in the six acre tract, about 70 per cent utilized in the twelve acre tract and considerably thinned out in the eighteen acre tract. Staghorn sumac and elder, two species which are ordinarily not grazed, were being taken in all three tracts. Corylus or hazel is beginning to receive attention in the six acre tract but has not yet been taken to any extent in the other two tracts.

Phenology

In the opinion of many residents of northern Indiana, the seed crop of this year has never been exceeded. The cherry crop is perhaps the most remarkable and most conspicuous. As reported last month, the beech, elm and ash, have exceptional crops. To these species, at least in northern Indiana, there should be added sugar and black maple, basswood, hop hornbeam, hackberry, catalpa, and crataegus.

Types

Dr. Cain piloted Chapline, Day and Den Uyl to a white pine bog, as far as known the only one existing in Indiana. It is located about ten miles west of Valparaiso, Indiana, on Route U. S. 30 and is about 20 acres in extent. Dr. Cain attributes its presence to the early draining of land in the vicinity which lowered the water tables sufficiently to permit the invasion of white pine from the borders and caused the gradual transition of typical tamarack bog, into the present white pine stand. The ecology and flora of this area is interesting and will be reported on at greater length in the near future.

Litter Study (M-1)

Auten, with a party of three men, is conducting the study of litter as effecting porosity and water absorption in the surface soils. Investi-

gations during the month of June show that the soils in second growth forest which has not been plowed, is very comparable to conditions found in virgin forest. The surface nine inches of soils shows much greater porosity than in adjoining cultivated fields. Investigations thus far on pastured woodlots indicate that soils are much more compact than are those that are not pastured. An actual test of water absorption has been added to the methods of study used last year.

Auten secured the loan of a Potentiometer thru the courtesy of Ohio State Department of Soil, pending the purchase of an instrument for field use.

Locust Borer Investigation

Work on this project was started at the Central States Forest Experiment Station on June 1, 1931. Ralph C. Hall, Field Assistant is in charge of the work, assisted by Wm. H. Cummings and Gordon Z. Rayner, Field Assistants. The first two weeks of June were spent in a general reconnaissance of southern Ohio, southwestern West Virginia, northern Kentucky and southern Indiana. This survey indicated that black locust is quite generally distributed throughout the regions visited. The locust borer was likewise generally distributed, being found wherever the black locust was growing. The formation of nodules thru the agency of nitrifying bacteria was found reconnaissance generally over this region. They were observed in soils derived from limestone, sandstone and shales, both glacial and residual in character. Early investigations indicate that nodule formation may occur in soils ranging in pH from 4.8 to 8.2.

Sample Plot Work

Since June 17, most of the work has been confined to the establishment of sample plots in cooperation with the Forest Service crew making a study of yield in black locust. To date 15 sample plots have been established in cooperation with Kellogg's field party and 5 plots have been established independently. No attempt has been made as yet to analyze these sample plot data except in a general way. It is apparent from the material collected to date that a relationship exists between crown class and locust borer attack. From the analysis of 17 plots containing 894 trees the following relationship exists:

		Attack in per cent			
Crown Class	No. Trees	Serious	Medium	Light	None
Dominant & CD	368	26.4%	40.2%	29.3%	4.1%
Intermediate	216	58.8	32.9	7.9	0.4
Suppressed	310	84.4	11.7	3.9	0.0
Total	894				

It would appear from the above table that locust borer attack is definitely related to crown class, the most thrifty trees showing least attack and the least thrifty showing most severe attack.

Other Insect Observations

Periodical Cicada Tibicina septendecim. Brood V of Marlatt has emerged this year in the eastern half of Ohio. They are very abundant in the eastern part of Ross County, especially southeast of Chillicothe, Ohio, in the vicinity of the Scioto Trail State Forest. Emergence in that locality took place the latter part of May with a few individuals emerging as late as June 5. Oviposition took place between June 7 and 17 and with a few individuals still ovipositing on June 17. A collection of adults was made on this area on June 17. The adults were collected by hand picking and within a period of 15 minutes about one quart had been collected. This insect is causing serious injury to young trees of all species in that locality by oviposition in the twigs which later die and in many cases break off. Some black walnut trees were noted here that had 100 per cent of the foliage killed as a result of oviposition by this insect.

The European Elm-scale, Gossyparia spuria. This insect is causing considerable damage to the elms in the parks and along the streets of Columbus, Ohio.

Oak Scale. A scale was found working on small twigs of oaks in western Madison County, Ohio. Damage consisted of the killing of small twigs and branches. Specimens sent to Washington for identification.

Black Weevil. A small black weevil was found defoliating black locust, being quite serious in West Virginia but quite generally distributed throughout Ohio, Kentucky, and Indiana. Specimens sent to Washington for identification.

Catalpa Sphinx. Observed in only one locality to date, and on only one small tree near Wilmington, Ohio.

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INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION

General

Junior Range Examiner Selar S. Hutchings was transferred effective June 12 from Region 4 to the Station and assigned to the spring-fall range project. Mr. Hutchings has spent the past school year at Yale working for his master's degree.

Field assistants who reported in June are Geo. M. Fisher, Univ. Idaho, E. C. Crafts, Univ. Michigan, Ray Price, Univ. Utah, Miss Sylvia M. Griswold, Univ. Chicago, to the Great Basin Branch; E. R. Crook, Mich. State College and Liter E. Spence, Asst. Professor University of Idaho, to influence studies; Floyd L. Otter, Asst. Professor of Forestry, Univ. of Idaho, and A. F. Dodge, Iowa State College, to forest management project.

Forest Management

The work of remeasuring the series of 19 five-acre plots in western yellow pine type in Idaho is under way. Three of the plots were established in 1913 and cut-over during that year. These three plots were remeasured in 1918 and 1926. The balance of the plots are virgin western yellow pine and were established in 1913, and remeasured in 1918. It is encouraging to find on the cut-over plots that over 700 new trees have come up into the stand during the last five years. Superficial examination of the virgin plots indicates that a very heavy loss from insects will be found although it is believed that a substantial net increase will be shown.

One of the surprising features of the remeasurement to date has been the heavy deer damage to reproduction under 4 1/2 ft. in height. Record of the damage is being taken. The plots are on spring range used by deer from the South Fork of the Payette Game Preserve and indicate that there may be a real overstocking of deer on the lower elevations of the South Fork of the Payette drainage.

Close to one of the plots a rather unusual Douglas fir stump was located. The tree was cut about 15 years ago but the stump still lives. It has grown about 1" in diameter since cutting and the cambium is thoroughly alive. It stands about 15 feet from an old mature Douglas fir tree. No doubt the roots have grown together and the continued growth is the result of this grafting process.

The fire analysis project is progressing satisfactorily. The coded data for the 10-year period for the Payette, Boise, and Idaho Forests has been forwarded to Washington for card punching. Checking of the data for the other four forests will be completed during July.

Range Management

Great Basin Branch

This is the regular alternate year for mapping all of the quadrats and major plots at the Great Basin Branch. Field crews were started in June and practically completed all the work at the lower elevations in

the oak zone. During the month there were completed two new enclosures of several acres each and several of the older plots were refenced. The fences are constructed six feet high to exclude deer, and a small mesh woven wire was used near the ground to exclude rabbits. A rodent-proof fence was placed around the new artificial reseeding nursery.

Spring-Fall Range

Craddock has returned from the U. S. Sheep Experiment Station near Dubois, Idaho, where, during the past 2 1/2 months he has been engaged on the spring-fall range project and supervising the construction of fence for 4 additional 80-acre paddocks and several protected areas. In the range investigations Mr. Craddock was assisted by E. R. Crook, a recent graduate of Michigan State College.

The influence of climate on forage growth and on livestock condition was strikingly exhibited on the Sheep Station range this year. Plant development records taken on a number of individual staked plants indicated that growth started this year the same time as last. From April 1 to April 20 the 1931 growth curve duplicates the 1930 curve, but for the next 30-day period growth this year lagged to a point 20 per cent behind last year. Showers occurred between May 20 and June 1, however, and in response to this stimulus the growth curves of all species examined quickly reached a point 33 per cent beyond the final measures secured in 1930.

Spring forage over the entire Snake River Plains was this year reported excellent by stockmen and with the exception of a shortage of water for stock, lambing was good. On special areas of the Sheep Station range the vegetative cover appears to be rapidly approaching the condition often quoted by old timers who claim that in early days the bunchgrasses were thick enough to be cut for hay.

The climatic influence has been just as strikingly exhibited by the condition and yields of the livestock on the Station range. A summary of operations since the start of breeding last fall points out this influence quite clearly.

Heavy rains fell over the station range last fall before the sheep returned from the summer range. Warm weather permitted a considerable amount of fall growth. With an abundance of feed, the herding operations started with the herds in excellent condition, but before the breeding season was over heavy snows occurred. The sheep were immediately trailed to the feed lots, since the winter range was too heavily snowed under, and as a consequence the sheep were fed two months longer than usual during the winter.

The break in the breeding operations caused an increase in the number of dry ewes this spring, but this was offset by a large number of twins. In addition the sheep returned to the spring range for lambing in much higher condition than if they had gone as usual to the winter range. At shearing, mature sheep weighed from 10 to 20 pounds more than last year and all through lambing the ewes had abundant milk for the lambs. In spite of a 2 per cent higher dry band the herds went to the summer ranges on July 1 with a 96 per cent lamb crop, the same as last year.

The most outstanding example of the influence which condition may exert on yields was reflected in the 1931 wool clip. In 1920-21 the station herds yielded a good average wool clip of approximately 9.00 pounds. Through careful selection, culling and management the wool clip has been raised each year until in 1930 11.00 pounds per head were taken. This year, with the herds saved from the rigors of the winter range, the wool clip averaged 13.15 pounds per head. Much of this 2.15 pound increase over last year must be attributed to the extra feed furnished the sheep during the long winter, but the inherent quality bred into the sheep is likewise a potent factor. An adjacent commercial outfit which runs a different type of range sheep took a 7 1/2 pound average clip this year.

Influences

Streamflow this year almost everywhere throughout the region is the lowest on record. This is the result of deficient snowfall during the past winter and practically no rain during the spring months. Except for a few places where there is reserve reservoir storage, prospects are that crops on irrigated land will suffer the latter part of the season. The previous low year was 1924, but 1931 is considerably drier. Salt Lake City has been forced to acquire some additional water rights and to expend considerable money for developing additional water for city use. The Boise River on July 1 was the lowest it had ever been on that date in 35 years of record and storage reservoirs were practically half empty. Under average conditions draft on storage in this project is not necessary until the latter part of June.

An important exception to extremely low streamflow on July 1 was found in the streams in Davis County, Utah, which were seriously flooded last year. The channels of these steep mountain streams were cut out by the floods to a depth of as much as 60 feet, often to bedrock. The theory explaining the better streamflow than might otherwise have been expected is that water consumption by vegetation along the stream courses has been practically eliminated and that portion of the streamflow which previously occurred as sub-surface flow in the streambeds now comes out of the ground where it is available for diversion into the

irrigation ditches. In other words, practically all of the streamflow which originates on the watershed reaches the ditch intakes at the mouths of the streams instead of a part being intercepted by vegetation along the streams or a part escaping as underground flow.

Biological Investigations

Locke and Forsling spent a little over a week in June with the Kaibab Investigative Committee making an examination of the Kaibab deer ranges. This committee consisted of Dr. T. Gilbert Pearson, Chairman, New York City, representing the National Association of Audobon Societies; George D. Pratt, Vice Chairman, New York City, for the American Forestry Association, American Game Association, and the Camp Fire Club of America; Mark Anderson, Secretary, Provo, Utah, Izaak Walton League; Jos. S. Dixon, Berkeley, Calif., National Park Service; Dr. E. R. Hall, Berkeley, Calif., American Society of Mammalogists and Museum of Vertebrate Zoology; K. C. Kartchner, Game Warden, Phoenix, Arizona, Arizona Game & Fish Commission; J. M. Macfarlane, Salt Lake City, Utah, American National Livestock Association; A. A. Nichol, Tucson, Arizona, University of Arizona, and the Arizona Game Protective Association; and Paul G. Redington, Washington, D. C., U. S. Biological Survey. In addition several representatives of the Forest Service, Biological Survey, the Park Service, and the University of Arizona accompanied the committee a portion or all of the period.

It was the conclusion of the Committee that although the most serious congestion of deer on the range has been largely eliminated, there are still more deer than the available forage will permit. The Kaibab area is not now producing more than 10% of the available and nutritious forage this range once produced. Reproduction of aspen, western yellow pine, spruce and white fir is being prevented and many of the more palatable shrub species are being damaged on the summer range. Likewise on the winter range, except on the east side, the more important forage species are failing to improve. It is concluded that the number of deer should be reduced further to a point much below the present carrying capacity of the range in order that the better forage plants might revegetate and a larger number of deer eventually be grazed.

Carefully planned studies are needed on the Kaibab from the standpoint of taking advantage of this excellent opportunity to learn more about game management in general as well as for the management of the Kaibab itself. The vegetation is the key to the management of the range and accurate records are needed to trace the degree of grazing and the changes in vegetation from season to season. Plans for future study there and the construction of additional study enclosures were discussed with members of the party and definite plans made to carry these out. A cooperative project to be carried out by the Region, the

Intermountain Station, and the Biological Survey is being developed. A technical grazing man will be assigned to the forest this season and more intensive studies of forage relationships will be started.

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NORTHEASTERN FOREST EXPERIMENT STATION

Behre spent the second week of June in the Lake States on his return from annual leave in the West. This afforded an opportunity to become familiar with conditions in that region and to compare notes with the men engaged in experiments similar to those in the Northeast, especially studies of northern hardwoods and of forest fires. He spent a day at the University of Michigan, discussing the fire statistics reports with Mr. Dana, and arranging for the completion of the reports at the Station.

Stickel completed the revision of his report on the fire weather studies at Cranberry Lake and this was submitted to the New York State College of Forestry for publication.

Satisfactory progress is being made with the analysis of the fire weather records from Petersham, Massachusetts. It is of interest to note that in the drier climate at Petersham, the hygrometric factors are assuming larger importance than at Cranberry Lake.

Westveld made a trip to Bolton, Vermont, to go over some experimental girdling operations being carried on by E. S. Bryant. Mr. Bryant is going over his entire property of 3,000 acres in a selective girdling operation which aims to release spruce trees which are at or near merchantable size and which appear in danger of succumbing to suppression if not released. In this work Mr. Bryant is trying to put into practice the theories which he has worked up as chairman of the New England Section Committee of the Society of American Foresters, which holds that girdling to release merchantable softwoods is the most profitable silvical operation. Westveld tagged a number of trees so that detailed information on the results of the operation may be available in the future.

Westveld left for the Gale River Experimental Forest in the latter part of June, and has been engaged in planning for a cruise of this area and in making his annual counts of germination of the large number of seedbed quadrats which he has under observation on the Cherry Mountain sample plots.

Jensen has completed his end of the reports on the gipsy moth control plots. These reports give tables showing the development of

the various stands following the treatment for gipsy moth control in 1914 and 1915. He conferred with Mr. Guild of the Gipsy Moth Laboratory, regarding the final form of these reports which now await action by Mr. Guild.

During the last week of June Jensen started survey work on the Bartlett Experimental Forest. He is running out final locations for the eastern boundary of the tract, and laying out control lines for the intensive management cruise of the entire area which will be conducted this summer.

Jensen and Westveld spent some time together, trying out various methods of making the management cruises of the experimental forests most effective and efficient. They have decided to use square sample plots, one quarter of an acre in size at five chain intervals along the strip lines as the basis for their estimates. One corner of each plot will be marked with permanent cypress stakes and the other corners will be marked with semi-permanent stakes of local material. Reproduction counts will be made on a strip of 10 milacres extending along the boundary of the plot at right angles of the survey strip line. This system will give a satisfactory sample of the area, will make possible an accurate measure of growth by retallies in the future, and will make possible a recomputation of the cruise by individual compartments or subcompartments without duplication of field work, if the boundaries should be changed in time.

In order that the men who will conduct this cruise may make an intelligent estimate of defect in the field, it is planned to spend a few days studying hardwood cull at the landings of recent cut-over areas and at hardwood sawmills. A more adequate basis for defect estimate is also being provided thru special studies which Doctor Spaulding now has underway on the experimental forest.

Spaulding is analyzing the decay in both northern hardwoods and balsam fir in relation to external appearance of the trees. This is being done by felling and sectioning the trees on sample areas of which careful notes have been taken in advance of cutting.

Doctor MacAloney has been working with Spaulding on this job so as to obtain information as to the part insects play.

Early in June the management survey and map of the Mount Toby Demonstration Forest of the Massachusetts State College was completed. The experiment station cooperated with the college in planning the field work and supplied some help in the completion of the map. One quarter acre circular sample plots at five chain intervals were used as the basis for this survey, and a detailed type map of the entire area was prepared.

The emergency construction work on the experimental forest roads terminated during the last week in June, having exhausted all the funds allotted without having completed half of the roads laid out.

On the Bartlett Forest three bridges were constructed and a road surfaced with rotten granite completed from the Bear Notch automobile road to a point about one quarter of a mile beyond the Bartlett water supply. It was only possible to make about 0.2 of a mile of the Louisville Brook road passable. Beyond this point the right of way has been cleared and some blasting done for about one half mile. This portion of the road could probably be used in winter time.

On the Gale River Forest unusually difficult conditions for road construction were encountered. There is practically no soil to be found. The surface of the ground is strewn with large rocks and boulders with vegetable mould and muck filling the cracks. It will be necessary to haul in and surface the roads to be constructed on the Gale River Forest. The quarter mile cut off between the Gale River road and the Maplewood road was completed and about three eights of a mile of the lower road going west from the Maplewood road was surfaced. The right of way was cleared and roughly graded for an additional quarter mile of this road to the permanent interior corner of the forest. The upper road which ascends the slope of Mount Cleveland was cleared, considerable blasting work done, and the surface graded so that it will be suitable for winter use for about seven-eights of a mile.

In addition to this the driveway leading into the headquarters building was re-surfaced and the triangular plot where this driveway meets the state highway was leveled off and seeded down to grass.

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NORTHERN ROCKY MOUNTAIN FOREST EXPERIMENT STATION

Following his long siege of extensive revision computations, Haig spent ten days at the Priest River Branch to break in the field crew which will make the annual examinations and remeasurements of our large series of reproduction and methods of cutting plots. The crew this year is composed of Professor R. A. Williams, New York State College of Forestry, who is crew leader, and Field Assistants Fred Agri, Herbert Willison and Jack White.

The plan for Haig this year is to have him spend most of the summer in the office where, with adequate clerical help, a strenuous effort will be made to clean up the greater part of the compilation and report writing on silvicultural projects with which the Station is badly behind. The policy of employing a full time computer for the entire winter season, which has been followed during the past several winters, has already given gratifying results in this connection. The methods of cutting and reproduction files are now in excellent shape, with all plot

records up to date. Haig hopes to put the mensuration study files in similar shape by the end of the summer and to complete the analysis and write-up of the reproduction phase of the transect study of cut-over areas. Both of these jobs have been long pending.

During the past month Temporary Assistant Willison completed the computation of plot values for twenty-three semi-permanent yield plots which had been giventheir first five-year remeasurement during the 1930 field season. One of the striking features of this work was the rapidity with which the values for these semi-permanent plots can be derived, Willison finding it possible to average two a day, while preliminary work indicates that permanent plots of this sort would take from two to four days apiece. This is another indication that a large number of semi-permanent plots well scattered over various locality sites, age classes and in various conditions supplemented by a skeleton series of permanent plots, will give accurate information on growth and yield with the least possible burden in remeasuring and recomputing plot values at periodic intervals.

The value of semi-permanent plots is amply illustrated by the unexpected results obtained from the computations just completed. Of the two groups of plots remeasured in 1930, one was in a 50-60 and the other in a 100-110-year western white pine stand. Both stands show much more rapid growth than the normal yield tables indicate for stands of comparable age and site. The 50-60-year group, for example, has averaged between 250 to 295 cubic feet per year during the past half decade compared with a normal growth rate of 160-180 cubic feet per year. Several plots in this group produced over 2,000 board feet per year in trees 7 inches and up (International Rule) and several plots in the 100-110-year group made over 3,000 board feet per year by the same standards. These growth rates are from two to three times as large as comparable growth rates from the normal tables. The plots remeasured indicate a distinct tendency on the part of these particular stands to increase toward normal stocking. The several overstocked plots in this group, however, held their own over the last five-year period and showed little or no tendency, as a group, to decrease towards normal values.

These striking and unexpected findings show the desirability of studying rate of growth by actual remeasurements on a large variety of well distributed semi-permanent and permanent plots not only to check predicted values derived in other ways but to learn of the variations that may be expected from the normal in localized areas.

Gisborne and Hornby (Regional Office) returned to Missoula on June 27, having spent about 8 weeks in Washington on the sorting, tabulating and preliminary analysis of the Region 1 fire records for the period 1921 to 1930 inclusive. The tabulations obtained include summaries of the various factors which need to be considered in reviewing fire control practices from: 1. The historical viewpoint including

number, cost and area burned, by Forests, by timber and fuel types, by years, by causes, etc. 2. The effects of both timber and fuel type on occurrence of fires; their size when reached at various time intervals after origin; the effects of exposure, altitude, etc.; and the determination of the actual area burned in easy, average, and bad years within each timber type in reference to the permissible limits established by the Washington meeting of Regional Foresters. 3. The Hour Control needed in each type if losses are to be held within the permissible limits. This phase of the analysis was most detailed and included all phases of control from origin through detection, report, get-away, travel, and suppression. Both speed and strength of attack, including reinforcements, were studied, with the fires separated into those controlled within 1 day (24 hours) after origin, 2 days, 3, 4, 5, 6 to 8, 8 to 15, 15 to 30, and over 30 days. The exceptionally large fires, which are the ones that resulted in more than the permissible area being burned, have been identified and all of their characteristics will be studied in detail. 4. The determination of intra and extra period fires during 1925 to 1929, and 1930 separately as requested by the Washington Office of Operation. This job, which probably would have required over 100 man-days' time if done by hand compilation from the original fire reports was completed in 13 man-days' time by use of the punch carded data.

Before leaving Washington, Gisborne and Hornby presented to a meeting of some members of the Branch a statement of the outstanding results obtained to date. There were many phases of this work, however, which had been only partially tabulated and studied at that time, so that this report was necessarily rather fragmentary. Some tabulation work still remains to be done before preliminary results are sufficiently complete to warrant presentation to and discussion by Region 1 officers.

More than the usual difficulties have been encountered this spring in the measurement of fuel inflammability at our various stations. The duff hygrometers proved to be exceptionally difficult to calibrate accurately, and there were more of them to be calibrated than in the past. One hygrometer was broken in shipment, and one instrument shelter at Priest River was crushed by a tree blown over by an exceptionally strong wind. These things coupled with Gisborne's absence and Thompson's overload of emergency construction work at Priest River have resulted in a loss of early reports of duff inflammability from several stations. Fortunately, June brought good rains throughout most of the Region and there has been less than the usual need for measurements of prevailing fire danger.

The weather record for the last 10 days of June at the Priest River Station compares to normal as follows:

Item	June 21-30, 1931	Normal
Rain	0.40"	0.60"
No. of rainy days	6	3
Ave. 5 p.m. Rel. Humidity	57.3%	46.6%
Ave. max. temperature	66.4°	77.2°

PACIFIC NORTHWEST FOREST EXPERIMENT STATION

Fire Studies

The hour control study for the east Oregon and Washington forests is completed except for a few charts now being drafted. The main study was completed a month ago, but various supplementary analyses appeared desirable, though not absolutely essential, in order to cover all possible angles to this problem. Conferences with Brundage and Grefe some time ago resulted in the establishment of hour control standards for the individual forests, and the transportation study is now utilizing these standards.

Simson left the Station June 1 to take the place of D. L. Beatty, who has resigned, in charge, under the general supervision of Assistant Regional Forester Horton, of the study of portable radio equipment and communication. The headquarters for this work have been established at Vancouver. Simson was one of the charter members of the Station and has done a great deal of valuable work; our best wishes for success in his new assignment go with him.

Thunderstorm Prediction from Static

Albin G. Jacobson, who was McArdle's assistant two years ago, arrived on June 15 as a field assistant; and for the present he is taking over the static work formerly handled by Simson. That static meters will be in operation again this year after making a few adjustments which were found desirable as a result of last season's experience. Two more are being constructed, making seven that will be put on the forests. It is expected that some sort of cooperation on this study can be developed between the Station and the physics department at Reed College.

Lightning Study

Plans have been made to complete during the summer the coding of the lookout lightning storm reports for the past three seasons. If machine analysis of these reports can be made early next winter, it will be possible to prepare a report on this project before the next meeting of the Investigative Committee.

Douglas Fir Slash Disposal

McArdle has revised the working plan for the Douglas fir slash disposal study, and has drafted a preliminary plan for the fire damage study. At the request of the Regional Office, the Station also is working on methods for measuring the existing degree of fire hazard in various parts of the region.

McArdle spent a week in California attending the meeting of the advisory fire committee for the Shasta Experimental Fire Forest.

Mensuration

Methods of constructing yield tables and stand tables and of predicting yields in both the Douglas fir region and the western yellow pine region were the subjects of talks given by Meyer to the sophomore class of the College of Forestry of the University of Washington. Emphasis was laid upon the studies which the Experiment Station had completed and published during the last few years.

Much of the remainder of the month of June was spent by Meyer in going over the available information on growth and yields of all species found in Region 6 and formulating tentative plans for making growth estimates for the forest survey.

Silviculture

Douglas Fir Natural Reproduction

Early in the month Isaac was at the Wind River Branch Station and made the instrumental set-ups on the sample areas where measurement of physical factors is being made. This study, now in its fourth year, has been confined to three cover types on a flat area. Later this season, when the drouth period starts, it will be extended to north, south, east and west exposures for short periods of time.

Later in the month the grazing and reproduction transect in the Wind River valley and the semipermanent reproduction plots there and in the lower Columbia region of Oregon were given the first seasonal examination. The 1931 reproduction found was less than was expected following the "medium" seed crop of 1930. So far this year the seedling loss has been comparatively light.

Methods of Cutting Western Yellow Pine

The project known as the Methods of Cutting Study now has 21 permenent plots with approximately 280 acres in central and eastern Oregon. A recent examination of four of these plots located on the Crater Forest gives the status of the 1930 cone production and this spring's resulting germination.

Plot No.	No. trees per Acre with Heavy Crop	Med. Crop	Light Crop	Total No. Trees with cones	No. 1931 Seedlings per A.	No. 1931 Seedlings Growing Singly	No. 1931 Seedlings in groups
Crater #1	.2	1.6	6.8	8.6	4	4	0
Crater #2	.22	3.4	11.3	14.8	444	130	314
Crater #3	1.43	2.3	2.7	6.5	156	72	84
Crater #4	.3	1.5	6.9	8.7	97	21	76

Plots 1 and 4 were cut following the standard method, with the exception that the bull pine groups were thinned on Plot 1. On Plot 2 about 1/3 of the merchantable volume was reserved in a selection cutting, while on Plot 3 scattered large trees were left for seed trees. These plots were cut over in the spring of 1928, but adverse growing conditions, rodent damage and light seed crops have resulted in no subsequent seedlings surviving from one season to the next. It is noteworthy that of all the recorded seedlings for these four 10-acre areas, only one was found to be growing without the protection of a bush or other covering such as slash or large limbs. However, quite a number of dead seedlings were noted in the open. These appear to have died from either heat or cold, while others were undoubtedly destroyed by rodents. It seems quite possible that in this locality with an elevation of approximately 5000 feet, frost would be a prime cause of mortality in the open.

The unusual heavy rains during the last week of June in central Oregon will without a doubt bring about the establishment of many new seedlings on the yellow pine cut-over lands that during the last decade had little or no new growth coming in. However, since the rains unusual heavy frosts have occurred over the region for this time of the year, and very likely there will be a high mortality of the tender new seedlings growing in the open.

Experimental Forests and Natural Areas

The construction of a headquarters cabin for the Pringle Falls Experimental Forest was begun during the latter part of the month. The new building, located on the west bank of the Deschutes River, is 40 feet long by 16 feet wide, and contains an office, a kitchen, and a garage. The cost will be about $450.00.

Another natural area has been set aside by the Forester, namely the Metolius Area of 1440 acres of western yellow pine type on the Deschutes Forest.

Mill Scale Studies

Field work has been completed in mill scale studies conducted in four sawmills in cooperation with the West Coast Lumbermen's Association. The data are being prepared for compilation on a Hollerith tabulating machine. Director Munger made two trips to Seattle during the month to go over with Messrs. Kirkland and Brandstrom and the cooperators the details of this project.

Selective Logging

Time and cost studies of logging have been somewhat handicapped by the closing down of logging operations. However, relatively little work remains to be done in completing the field work connected with this phase of the selective logging study.

Logging studies were carried on on the operations of the Tidewater Timber Company and the Crown Willamette Paper Company near Astoria, Oregon, and in Washington on the operations of the Merrill & Ring Lumber Company at Pysht, the Snoqualmie Falls Lumber Company at North Bend, and the Aloha Lumber Company in the Grays Harbor district.

Much of the data collected to date are in the process of preparation for final reports. Interesting results are indicated in the comparison of operating efficiency obtained by different companies. As far as may be judged by figures obtained thus far, these point toward the deduction that operations laboring under the burden of over-valued stumpage are relatively much more efficient than those with under-valued stumpage. That is, the urge controls the degree of effort expended, thus tending to level out the basic inequalities that otherwise exist between different operations. Since the urge follows the errors in timber valuation, it may be assumed that operating efficiency may be more closely harmonized by correct valuation of stumpage.

Forest Insurance

The field work in Grays Harbor County was completed at the end of the first week in June. Field Assistant Tucker was released at that time and Vose brought into the office to work on the office work-up of the data. At the end of the month this was brought to a point beyond which there is no practical advantage in going at this time. That is, the damage estimates have been completely worked up and the final tables constructed showing losses to merchantable timber in the two classes, and second growth and reproduction in three classes. Tables have also been constructed showing the comparisons of fire wardens' figures with those from the field analyses by individual fires and grand totals.

Reese Taylor completed the collection of data at the Portland Weather Bureau Office the first week in June, and then went to Seattle to transcribe the western Washington fire weather data.

Shepard's work in the office was mainly devoted to the problem of developing the proper technic of conducting the causative hazard study. This is somewhat baffling because of the necessity of being sure that correct isolation is achieved. Nevertheless good progress has been made and the working plan report for this phase is well along toward completion.

An extremely interesting call was received from Horatio Bond, Chief Engineer of the National Fire Protection Association. Discussion with him brought out more strongly than ever the close analogies that exist in several phases of their problem to similar phases of our protection problem. This is particularly true with respect to the improvement of data through better reporting of fires and the development of the correlation between fire behavior and protection technic.

Forest Survey

The various survey crews working on the strip survey of Lewis County, Washington finished field work at different dates from the 15th to the 25th of June. Some of these men returned to their work of inventorying the national forests, some resumed the check cruising for the adjustment of the private cruise data in the region, and the others have been working steadily on the compilation of the field data gathered on the strip survey.

The last three or four weeks of field work for all the parties in the field have been extremely strenuous inasmuch as the hardest, most inaccessible country was left until the last. Crews pushed their lines forward by using horse packers, human packers and no packers at all when lying out on the line overnight between camps. If work plans on this job had been based on an 8-hour day, the crews could not even have gone to and come from the job on some days. The Arkansas day of "can see to cain't see" was in effect much of the time. Rainy weather and altitude combined with rough country, heavy timber, and lack of roads and trails made some of the assignments pretty tough propositions, not only while doing the work during the day but in camp, if the set-ups at night could be called camps.

Eighteen men at one time or another spent 960 man days in the field on the job, and 900 of these days were spent on the line rain or shine. The costs of field work (exclusive of any overhead, checking, etc.) were as follows:

Personal service (exclusive of packers)	$6838
Travel and subsistence	1955
Camping expense (packers, horses, grub)	1152
Car expense (at 3¢ per mile)	353
Equipment	150
Total	$10,448

Three-man crews averaged 1.56 miles of line per day, and 2-man crews 1.24 miles per day. Since the third man in the crew was a temporary field assistant and also since the two-man crews did not work in the most inaccessible country, the cost per mile was less for the three-man crews. About 486 miles of line were run which called for about 3,888 sample plots. Many of these plots were not on forest land, and to date the total number of plots on forest land has not been counted up.

Buell finished his compilation and recapitulation of the type and volume data for all of Lewis County by the compilation method, and also a separate recapitulation for the 40 townships done by the strip survey.

Girard and Kline finished the adjustment cruising in Lewis County after cruising many more descriptions than was first thought necessary. The many ownerships in the county which had furnished the survey cruise data made it seem impractical to get an accurate correction factor for each individual source of data unless an undue amount of time and money were to be spent. On the other hand the 1907 county cruise which covered the entire area was considered to be too old and out of date to be of any use inasmuch as with a large amount of forest land in the county running Site II or better, descriptions which might have had tie-size timber in 1907 might have 50,000 or more feet of saw-logs per acre now. These facts made the adjustment cruising in this county a rather difficult job, and one for which a material amount of ingenuity in cross checks and indirect comparison might be necessary.

There were four major ownerships in the county which represented the majority of the timber. It was decided to concentrate the checking on these ownerships. About 10,000 acres in units of from one-quarter section to a section in area were carefully covered by 10 per cent cruise. These units were well scattered throughout the four major ownerships. A comparison of the check cruises with the cruises that had been furnished by the companies showed a wide difference, in some extreme cases varying as much as 200 per cent for an entire section. This wide difference in certain cases, between the original cruise and the check cruise, brought out very clearly the importance of investigating all sources of information that would give any light on the problem before computing any correction factor. The wide variations found between the original cruise and the check cruise were generally inthe DC stands or the young age classes of Douglas fir. There are considerable areas of Site I in this county and Douglas fir trees that were 16" in diameter

in 1907 might be 24" to 26" in diameter in 1931. This accounted for the wide difference in some cases. Two and one half sections of check cruise of one large ownership showed satisfactory uniformity and a correction factor was computed that would bring this private cruise to the same standard as the check cruise.

One large ownership was rather difficult to adjust because of the wide variations found in the cruise in different places. In order to get the correction factor for this ownership it was decided to copy the county cruise for the 10,000 acres that had been check cruised and then compute a correction factor that would bring the county cruise to the same level or standard as the check cruise. The next step was to select at random some 20,000 acres of the privately owned lands referred to and copy the county cruise for this area. It was then possible to compute a correction factor that would bring the county cruise to the same level as the private owner's cruise, and also compute a factor that would bring the private owner's cruise to the same standard as the check cruise. These figures were then compared with the factors which had been previously computed for each ownership. These and other cruise checks made it possible to compute a factor which, in our judgment, was very reliable. In order to get a further check on the reliability of the correction factor computed for the ownership previously referred to as running uniform, several thousand acres of this company's holdings were selected at random. The county cruise data for these areas were then copied. The correction factor which had been computed to bring the county cruise to the same level as the check cruise was applied to this total figure, and the same thing was done for the same lands using, of course, the correction factor which had been computed for the private owner. The amount of timber involved in this case was considerably more than 200,000 M feet, but the difference between the two totals after the correction factors had been applied was less than 100 M feet, or a negligible percentage. This was considered a very satisfactory check cruise. A large amount of cruising had been done in this county for exchange purposes, and these figures also served as a very valuable check against our correction factors.

Section of Forest Products

General

Allen H. Hodgson, who has been assigned to Forest Products Research since March, 1926, was transferred on July 1 to the Regional Office (R-6) where he is to assume the duties of Personnel Training Officer for the North Pacific Region. He is a very great loss to this Section.

Survey of Sawmill "Waste" in the Douglas fir Region

This project was finished by Hodgson with the completion of his report entitled "Sawmill Waste and Its Present Utilization in the Douglas fir Region of Oregon and Washington". This report, which was extracted

from the larger office report mentioned last month, is to be published in four issues of The Timberman, beginning in July.

The report shows that in the production of the 1929 regional cut of green, rough-sawed, lumber, 1,353,865,254 cu. ft. of sound wood, in sawlog form, was used by the sawmills. Of this volume 66.61 per cent went into the 10,286,554,000 feet b.m. of lumber representing the cut, 19.31 per cent went into "waste" wood as slabs, edgings and trimmings, and 14.08 per cent went into sawdust. In addition to the 452,054,952 cu. ft. of sound wood, converted into "waste" wood and sawdust, there was 167,010,205 cu. ft. (solid measure) of bark carried into the sawmills. This also was classified as "waste" making a total annual quantity of sawmill "waste" of 619,065,157 cut. ft. If this material were stacked on a square acre of ground, it would make a solid pile towering two and seven-tenths miles into the air.

It is shown in the report that about three-fourths of the sawmill "waste" is recovered and put to some use. The sale of by-products made from sawmill "waste" brings a yearly return of more than $8,000,000.00 to the sawmills while large quantities of it are used by the sawmills in the production of domestic power and steam. The heat value of mill "waste" used in this way by the sawmills alone is equivalent to nearly four and one-half million barrels of crude oil. Only about one-fourth (27.23 per cent) of the total mill "waste", or about one-tenth of the gross volume of the sawlogs entering the mills, is now actually destroyed in the refuse burners as true waste.

The principal by-products made from sawmill "waste" as brought out in the report are lath, handle-squares, shingle bands, pulpwood, screened pulp chips, fuel wood, hogged fuel and sawdust.

In conclusion, Hodgson has touched on the trends of industry as they relate to the utilization of sawmill "waste" in terms, tempered by the findings of his studies, that are quite optimistic. It is stated, for example, that there is a steady upward trend in the competition of uses for sawmill "waste", and with the introduction of a few more commercial developments requiring "waste" wood for raw material in the region, there is little doubt that an increased value on mill "waste" will result. This, he predicts, will react favorably upon a condition which is already being noticed, namely the improvement in utilization not only of sawmill "waste" but of logging "waste" as well.

Western Juniper Used for Novelties

Several attempts have been made to utilize the western juniper (Juniperus occidentalis) which covers quite extensive areas in eastern Oregon. About ten years ago a small concern started the manufacture of pencil slats but operated only a short time. It was claimed that the wood was too defective to be used economically for this purpose. At that time a large number of trees were uprooted and left lying in the woods to season. Recently there has been established at Bend, Oregon a small

plant for the manufacture of novelties from this wood. Their products include lamp stands, candle sticks, bowls and similar turned articles. At the present time they are using trees left in the woods from the pencil operation.

The finished articles have a very pleasing appearance, both as to grain and color. While not so hard as the Oregon myrtle, which is used extensively for this purpose, it is in many respects much more attractive.

Minor Forest Products Study

Johnson spent three weeks in the field on this study, securing information relative to the production and consumption of these products. With only a small amount of field work remaining, compilation of the statistical information is now in progress.

It is evident that the study will show a considerably larger production of poles and piling than has heretofore been reported in the regular census returns, due to the fact that many small operators were unearthed that have heretofore not been canvassed.

In the course of the study, it was found that Douglas fir slabwood and mill ends were being shipped from the coast mills into the treeless regions of eastern Oregon and Washington for fuelwood, a distance of 150 to 200 miles.

Felling and Bucking Study

Rapraeger's final report on "The Effect of Tree and Log Size on Felling and Bucking Costs in the Douglas fir Region" has been prepared and is ready for publication as a trade journal article. Field work on the companion study relating to "Wood Losses in Felling and Bucking" will be initiated as soon after the middle of July as possible.

Western Yellow Pine Mill Scale Studies

Rapraeger is now preparing a report for the Mt. Emily Lumber Co., La Grande, Oregon in appreciation of the splendid cooperation given at their plant during the period of the mill scale study. A report to be prepared by Rapraeger and Johnson for publication will cover the essential findings of this study together with some pertinent facts from the Shevlin-Hixon yellow pine mill scale study which have recently been analyzed.

1930 Census of Lumber, Lath and Shingles

The 1930 survey for this region has been completed. A total of 1870 schedules have been forwarded to Washington.

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SOUTHERN FOREST EXPERIMENT STATION

General

Demmon spent ten days at Camp Pinchot, discussing with Gemmer the present work of that Branch Station and making plans for future work there.

Demmon also stopped at McNeill, Mississippi, on the way to Camp Pinchot, and discussed the work there with Possin and Greene.

Lubbe attended the meeting of administrative assistants at Hot Springs, Arkansas, held for the purpose of discussing the new cost accounting scheme, to be put into effect on July 1.

Junior Clerk-stenographer Pearle H. Morris resigned on June 7 to accept a position with the U. S. Engineers in West Huntington, Va.

Mr. Franklin G. Liming, of the Dept. of Botany, Ohio State University, was appointed on June 19 to assist in a field investigation of the brown-spot needle disease of the longleaf pine at Bogalusa, La.

Mr. Ross W. Davidson, Assistant Mycologist of the Division of Mycology and Disease Survey, has been temporarily assigned to the Division of Forest Pathology. He arrived in Bogalusa, Louisiana, on June 25 to work on the identification of molds isolated from sap-stained pine and hardwood. Emphasis will be placed on the identification of the imperfect fungi.

Mr. Harold R. Hay, a graduate student at the University of Wisconsin, arrived June 17 to assist Lindgren this summer on control of sap-stain in lumber and stored logs.

One third of the Station's photograph index was completed during the month.

Management

Wahlenberg and Spillers left on the 29th for a short extensive survey trip in southern Mississippi, to obtain additional information bearing on longleaf and fire.

Chapman spent most of the month working up field data on the Urania thinning plots.

Naval Stores

Busch and Olsen inspected an area near Starke operated by Mr. Kirby Smith of Sampson City. After chipping 1/4 inch deep in the new wood, the chipper comes back a week later and makes what has been termed a "re-streak" in which another streak 1/4" deep is made on the first streak. Two or three regular streaks are placed on the tree before any "re-streaks" are made. From then on, each streak is followed one week later by a "re-streak." In this way the height of each face for the season is reduced almost half. This has been tried on 1800 faces and Mr. Smith claims that the yield from these trees slightly exceeds the yield from an equal number of trees chipped regularly on an adjacent drift. Ocular inspection indicated that apparently as much gum flowed from the "re-streaks" as from streaks made into the new wood. Samples of chips

from the "re-streak" and new wood streak were collected, treated and sent to Miss Gerry for a microscopical determination of the relative number of resin ducts in each sample.

Busch completed a model of a tree scribe for marking the width of a face prior to chipping it. This is ready to be sent to Washington for patent application.

Busch, after approximately one and one-half years of service, resigned from the Station staff, effective June 30th to become Senior Ranger in charge of Naval Stores operations on the Osceola National Forest. Olsen is temporarily taking over his work.

The headquarters of Averell, Heyward, and Diller were transferred permanently to Lake City early in June and with Busch also leaving Starke, the office space has been reduced by half. During the latter part of June, a considerable amount of time was spent in moving and storing furniture, equipment and supplies necessitated by this change.

Olustee Tract

Averell, Heyward and Diller, at Lake City, spent the past month in surveying the new Olustee Experimental forest. Their work consisted of re-running the property boundary lines by means of a transit and subdividing the area into 10-acre compartments. These compartments are permanently marked by iron-pipe stakes on which the compartment number has been stamped. A map showing forest types and relative density of stocking has also been completed.

Forestation

With the help of Student Assistant Diller, Gemmer put up 350 1-0 longleaf seedlings in paper cups, also 50 six-months-old stock. The current nursery work and summarization of data on exotic plantations were continued.

Protection, Grazing

Dr. Pessin and Student Assistant Watkins spent the whole of June at McNeill, Mississippi, taking current meteorological observations, counting seedlings, etc.

Many transplanted pine seedlings died because of a six weeks' drought. During the last week in June occasional small showers terminated this drought.

All seedlings and saplings originally measured on each quadrat in 1923 were remeasured during June. Many of the smaller seedlings that were

of no appreciable size in 1923 were missing in 1931. Trees of five feet or over in height seem to survive pretty well.

Although complete analysis of the most recent seedling count has not been made, the indications are that not many 1924 seedlings have died since last fall. This may be due to the light fire we had this year. Last summer's drought killed off so much of the grass that there was little left to burn.

Results on the competition quadrats indicate that the denuded quadrats have the highest evaporation and soil surface temperature and lowest moisture content of the soil while the check on the undisturbed quadrats show lower soil surface temperature, lower evaporation and higher soil moisture content.

Ecology

A pure culture of a fungus which produces mycorrhizas on longleaf pine roots has recently been obtained. As far as we know this is the first time that this organism has been isolated. The fungus is being propagated in several flasks and will later be submitted for identification.

Financial Aspects

Bond and Reynolds spent the entire month in the field in making a Study of the Financial Aspects of growing pine in Polk County, Texas. This study was conducted by running cruise strips over the entire county and by sample plot work on a number of sample farms. It comprises farms scattered in all parts of the county. This study is being made in cooperation with the Texas Forest Service and the Texas Agricultural Experiment Station, Dept. of Economics.

The revision of the Capper report data for Alabama, Mississippi, and Louisiana, was completed and transmitted to Washington.

Ziegler completed revisions of the Appling County, Georgia, and the Washington County, Florida, reports. These are background county wide reports which are to be followed by specific forest property case studies.

Erosion

The first week in June Sinclair and Meginnis were at Holly Springs, Mississippi, completing the installation of the first four run-off plots. These plots are part of a series to be used in measuring the amount of run-off and erosion occurring on 10 per cent slopes with the different types of cover most common in the Silt Loam Uplands of northern Mississippi. The following conditions will be studied.

1. Woodland cover- Upland mixed hardwoods
2. Woodland cover - Black locust plantation
3. Woodland cover - Scrub oak and brush
4. Pasture - Improved
5. Pasture - Unimproved
6. Broomsedge grass - Eroded and abandoned farm land
7. Cultivated - Cotton
8. Denuded - Mineral soil exposed and eroding

Each plot is 3 x 12 feet and isolated by a galvanized iron strip sunk six inches into the soil. A galvanized iron tank 2 x 3 feet by 18 to 30 inches deep, depending on the type of cover, is placed in the ground at the lower end of each plot to catch the run-off and eroded material. Records will be taken and the tanks emptied following every storm or in cases of prolonged rains, every three days.

Sinclair spent about two weeks in the office completing an erosion working plan and selecting equipment for further studies at Holly Springs.

On June 24 and 25 Sinclair joined a party of 15 Agricultural Agents and State Forest Department men from Mississippi and Tennessee on a two day trip through several counties in western Tennessee. The purpose of this tour was to visit some of the land reclamation projects being carried on by the Tennessee Forestry Department. Instances were observed where gullied land had been reclaimed with black locust which in 12 years yielded as much as 1000 posts per acre or a value of $200 based upon local market conditions. About 15 areas were visited including some small plantations of loblolly and shortleaf pine.

Mr. E. B. Deeter of the Bureau of Chemistry and Soils spent June 27 at Holly Springs, Mississippi, with Sinclair. Soils in the vicinity of the Holly Springs Experiment Station, where several run-off and erosion plots are to be established, were examined carefully and the various soil horizons described. pH determinations proved to be most interesting. The surface soil has a pH of 4.4 (very acid) which gradually changes to a pH of 7.2 (neutral) at 15 feet below the surface. Mr. Deeter was considerably impressed with the amount of erosion in northern Mississippi.

Forest Survey

Granger and Demmon spent two days in the field with the hardwood survey crews, going over portions of Lines 8, 9, and 10 in East and West Carroll Parishes.

The field work on the preliminary survey of East and West Carroll Parishes, Louisiana, was completed June 18th. A total of 239.6 miles of line was run on this preliminary work and data was collected on 1917 sample plots. Approximately 62 per cent of the area covered was in forest.

At the completion of the field work, Lehrbas and Cruishank came to New Orleans to help with the office analysis already started by Winters and Bull. Putnam, Wheeler, and Faulks started collecting additional data for the hardwood volume tables. They are also collecting data on the total cubical contents of the hardwoods of different diameters, heights, and species. It will then be possible to determine what portion of the total contents of the tree is actually used. Volume table data will be collected in Louisiana, Arkansas, and Mississippi. Measuring the numerous large branches is a tedious and time consuming job and 10 trees per day has been the crew's average. Where data are taken on Form 558a, two men can take 25-30 trees per day.

By the end of June the field data for the preliminary survey had been worked over and prepared for punch carding. This work has been carried on under the direction of Winters. The final analysis is to be made in Washington.

Lentz completed his revision of the hardwood survey working plan and drew up a rough tentative plan for the preliminary survey in the Southern pine region. For the pine inventory it is planned to follow the same general procedure as was followed in the hardwood survey and it is tentatively planned to select Pearl River County, Mississippi, for this preliminary work.

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SOUTHWESTERN FOREST AND RANGE EXPERIMENT STATION

The program of the Southewstern Forest and Range Experiment Station during April, May and June has been largely a construction program. A total of $39,700 was allotted to the station under emergency appropriations for relief of unemployment. Of this sum, approximately $34,000 has been spent or obligated, and between $5000 and $6000 has been loaned to the Regional Office, to be returned during the fiscal year, 1932. The allotment has been apportioned among projects as follows:

Telephone lines	$2,200
Buildings	14,800
Other structures (Mainly for erosion work)	9,400
Fences	6,000
Water development	7,300
	$39,700

Needless to say, the execution of such a large improvement program in the short space of three months has made considerable inroads upon

research work. Acceptance of the emergency appropriations committed the station to efficient utilization of these funds even at the expense of time taken from research. This temporary neglect of research has been condoned with the thought that the loss would be repaid many fold by the enlarged activity to be made possible by providing needed facilities for field work.

An outstanding accomplishment has been the installation of catchment basins for water and sediment on seven distinct drainage areas, each representing a typical condition on the Roosevelt watershed. These installations were accomplished under great difficulties because all materials used, including sand, cement, water and supplies, had to be hauled from 15 to 35 miles.

At the Santa Rita Experimental Range water has been piped 3 miles from a spring to supply the range headquarters and a new physical factor station to be equipped and operated by the University. Seven miles of new road have made accessible areas which formerly could be reached only on foot or horseback, and about 18 miles of old road have been improved.

At Fort Valley three cottages have been built for new personnel. In the experimental forest, some 6 miles of "road" have been cleared for as many hundred dollars. It is now possible to drive a light car within half a mile of any point in the forest.

The Jornada Experimental Range now boasts of 50 miles of graded road within its boundaries. A luxurious bachelors' apartment under construction is calculated to make range examiners content with single blessedness.

Two sample plots of 12 acres each, near Fort Valley, mapped in 1909, were remapped during June, with special reference to changes in natural reproduction. Only a few scattered seedlings or saplings were recorded in 1909. Now, about three-fourths of the area is more or less completely restocked. Most of the reproduction is of 1919 origin, although there is a representation of several older classes. These sample plots have been fenced against all grazing since 1910. Until a few years ago the contrast inside and outside the fences was most striking. A noticeable decrease in damage followed a reduction of grazing in 1921, and very substantial improvement followed a further reduction of grazing in 1926. The response to lessened damage has been so marked that the former contrast between fenced and unfenced areas can no longer be said to exist. Grazing prior to 1921 is known to have killed many seedlings outside the fences and injured most of those remaining. The majority of the latter class are recovering. Blanks remain where the seedlings were killed, but blanks are also to be found within the fences, due in this case mainly to excessive grass competition. Mice working in the dense grass of the fenced plots did much damage in the winter of 1926-27. Much less damage of this kind took place on the grazed areas, and it is reasonable to attribute the difference to grazing, since the fences do not exclude animals which commonly prey on small rodents.

It is plain from the foregoing that the effects of grazing are by no means all detrimental to western yellow pine reproduction. The conditions outside the above sample plots are typical of extensive areas on the Coconino, Tusayan and Sitgreaves. Under the relatively light grazing of the last 5 years, (involving reductions of about 50 per cent below 1925) damage sufficient to interfere with reproduction has become localized and confined for the most part to small areas. The silvicultural aspects of the grazing problem have receded into the background. Region 3 is now ready to announce that its western yellow pine cutover areas are restocking and that it has developed a practice under which it can make timber sales with the expectation that the land will restock.

Cooperrider's entire force, with the exception of Bliss, is now at Fort Valley making the periodic examination of grazing damage plots and establishing new plots in connection with the grazing - water relations study in the western yellow pine type.

Recent additions to the station personnel are Gordon D. Merrick, Oran B. Stanley, Volney Douglas, and Jack Keller, all field assistants in range research. Mrs. Eva C. Fleming has been assigned to temporary duty in the office of accounts to relieve Senior Clerk Walter P. Costello who has applied for extended sick leave.

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RESEARCH ACTIVITIES IN REGION 2

At the Fremont Field Station, considerable time, especially during the early part of the month, was given to carrying out the provisions of the M-1 (Management of the Station Forest) working plan relating to the cutting over of management unit Block C. Roeser completed the technical work involved in marking, tagging and measuring the two remaining uncut plots in the block, while Williamson gave most of his time during the month to completing the thinning and clean up work on five or six plots upon which this work had "hung fire" for over a year. A neat job was accomplished and a year's supply of domestic fuel wood was piled up in the woods.

Periodic phenological examinations were also made at Fremont in the seed production studies of western yellow pine, Engelmann spruce and Douglas fir. The primary object of these examinations, which have been conducted for several years on definite areas and on designated trees, is to procure a quantitative determination of the amount of flowering, and to note the effect of weather phenomena upon the character of the flower crop and the development of the resultant cone crop. Mention was made in last month's report of the destructive effect of cold weather upon the

On the 26th, Messrs. Thompson and Cochran, Regional Office of Management, made an inspection trip to Fremont and discussed immediate plans and progress of research work with Roeser. It is anticipated that Research will tie in with Management on two scheduled field trips before the close of the present field season.

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IN PRINT

Abell, Chas. A. and Hursh, C. R.	"Positive Gas and Water Pressure in Oaks." (Science, April 24, 1931)
Demmon, E. L.	"Economic Aspects of Forestry in the South." (Michigan Forester, 1931)
Frothingham, E. F.	"Clothes Make the Forester." (Michigan Forester, 1931)
Laxton, Josephine.	"Pioneers in Forestry, The Biltmore Forest School." (American Forests, July, 1931)
Lentz, G. H.	"Cotton fields of yesterday." (American Forests, June, 1931)
McCarthy, E. F.	"A Michigan Forester - Enough Said." (Michigan Forester, 1931)
Scholz, H. F.	"The Mapping of Forest Soils." (Ames Forester, 1931)

MANUSCRIPTS

PACIFIC NORTHWEST

Sawmill "Waste" and Its Present Utilization in the Douglas Fir Region of Oregon and Washington. Allen H. Hodgson.

The Effect of Tree and Log Size on Felling and Bucking Costs in the Douglas Fir Region. E. F. Rapraeger and Howard R. Spelman.

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flower crop of Douglas fir. The final spring observations indicated that the loss was even greater than was at first anticipated, and that the cone crop of this species will be very light as a direct result of the destruction of the flowers by inhibiting weather conditions.

The spruce and western yellow pine flowers emerged following the last spring frost and their normal development was not interfered with by adverse climatological conditions. The spruce crop was exceedingly abundant and a 100% set was observed. The pine flower crop was likewise heavy. Of the 1930 crop, all of the first year cones, representing 73.1% of the flower crop, survived the winter, but 4.3% dried up after starting the new season's growth. To what extent the occurrence of this loss helps to clarify the problem of pollination and fertilization in western yellow pine has not been determined.

Aside from procuring counts in two small source-of-seed plantations, no experimental study or planting was done locally. A heavy planting program is in prospect next spring. Approximately 4000 trees, including stock obtained by artificial crossing in strain A (mistletoe resistant) western yellow pine, are in the nursery at Monument. Spring counts indicated that the winter loss was small.

Roeser spent June 15 to 20 on the Gunnison Forest near Pitkin, to make measurements in the lodgepole pine methods-of-cutting study plots which were established in 1912. The original phase of this project, involving the study of natural reproduction, was concluded in 1926. Present plans call for continuation of the project in the form of an administrative growth study, in order to procure needed information on the rate of development of second growth lodgepole stands following clear cutting. Increment borings were made in virgin and selection cut stands within the strips used in the original study to provide a basis for comparing relative growth and volume production. The second growth stand on the clear cut plots averages from 10-14 feet high, with a maximum diameter of 2 1/2". In the residual 200 year old stand left after a selection cutting, a very pronounded increase in growth has been obtained with little windfall loss. No time has, as yet, been found to compile the data for the various plots.

The working plan for the Salt Creek erosion study project on the Pike was submitted, and by the end of the month, Plots 1, 3, and 5, from which cattle grazing is to be eliminated, were enclosed. Mr. R. R. Hill from the Washington office of Grazing visited the experimental areas in late June to study the grazing situation.

The preliminary report of the lodgepole pine thinning study project in pole and sapling stands on the Bighorn Forest, the field work for which was completed last year, was received by the Experiment Station early in the month and reviewed. The final reports for the administrative strip-survey growth study in Engelmann spruce by the increment boring method also were received from the Gunnison and Holy Cross Forests.

OFFICE OF FOREST PRODUCTS

Woods and Mill Studies

In doing some preliminary work on a utilization problem to determine the minimum diameter cutting limit in a western Montana yellow pine stand, to furnish a set requirement of round and square mining timbers, this office worked up for its own information the spread in the value of the products cut from the different logs in the tree. The following table illustrates quite clearly just where under present selling values the pay lumber occurs in the tree.

Tree DBH (ins)	No. of trees	Value per M (Lbr. tally) of the Products cut from the different logs in western yellow pine tree: Butt	2nd cut	3rd log	4th log	Top Log	Whole tree
14	9	$31.30	$24.12	$ ..	$ ..	$22.34	$27.28
22	14	29.63	24.90	..	..	20.06	25.55
24	10	37.21	31.94	22.73	23.34	19.49	29.39
31	4	42.67	21.78	18.12	19.54	19.41	26.92
38	3	32.20	35.35	28.09	19.57	16.14	28.33

Tree DBH	Value per M of Products Cut: Butt & 2nd cut	Butt, 2nd & 3rd logs	Butt, 2nd, 3rd, & 4th logs	Whole tree
14	$ 28.49	$ ..	$ ..	$27.28
22	27.15	..	..	25.55
24	34.66	31.74	30.32	29.39
31	32.60	29.13	27.55	26.92
38	33.71	31.95	29.68	28.33

The values are based on Western Pine Manufacturers Association prices for the first quarter of 1931, figured on grade, percentages only and are for rough green lumber. Values based on sizes (width and thickness) within the grades would show a greater spread between the logs and trees.

In order to more clearly understand the spread in value between logs and to relate this to the grades within the log, it is necessary to know something about the present selling value of western yellow (Pondosa) pine lumber grades. B & Btr. Select sells (wholesale) for about $10 a thousand higher than C Select. C Select is $20 per M higher than D Select. D Select sells for about $15 more per thousand feet than No. 2 Common. The

amount of No. 1 Common in the average western yellow pine tree or log is almost negligible. No. 2 Common lumber is worth $9 to $10 more than No. 3 Common and No. 4 and No. 5 Common sell for $7 and $11 less per M, respectively, than No. 3 Common. Shop lumber at the present time is in a slump and shop logs are worth even less than a good common grade of log. No. 1 Shop is worth slightly less than No. 2 Common lumber and No. 2 Shop sells for about a dollar less than No. 3 Common.

The butt logs in all of the tree diameter classes worked with, proved to be of the Grade 1 or Select type. The 38-inch tree contained two Grade 1 logs; the butt and second cut. The relatively low value of the products cut from the average 31-inch tree is due to the fact that it contained but one select log, the butt, and two shop logs (Grade 2). In woods and mill studies in this region the pines, both white and western yellow, have always showed a lower value for the products in tree diameters, ranging between 28 and 32 inches, than for those trees at either end of the range.

It is interesting to note that if the top logs in the 14 and 22 inch trees and the top and fourth logs in the 24, 31, and 38-inch trees were put into round and square mining timbers the value of the commercial lumber produced from the remaining logs in the trees would be increased $2.75 per M.

Woods Waste Survey

During the past month Mr. Anderson completed the analysis of the woods waste inventory after logging for the larch-Douglas fir type and lodgepole pine type. A trade journal article was prepared and is now ready for publication as soon as arrangements can be made. This completes this project for the inventory phase of the woods studies.

A.C.M. Relogging Study

Some of the valuable and interesting information resulting from this study was a stand table of the residual stand after the last logging operation in 1927. It was desired to use this stand table in predicting for the company the yield of mining stull material available 50 years hence. The only second growth western yellow pine volume table available that was considered applicable was based on the International rule to a 4-inch top diameter. Naturally it was not logical to use this table since the company is familiar with only the Scribner Decimal C rule. Furthermore, they can only utilize trees to a top diameter inside the bark of 6 to 8 inches. In order to use this International volume table it was necessary to determine the difference between the Scribner Decimal C scale of the material actually utilized for stulls and the International scale to a 4-inch top diameter. This was done by making a comparison of bull pine trees scaled in the breakage study at the A.C.M. camps. The

following table shows that the International scale to a 4-inch top diameter is 27.9% higher than the Scribner Decimal C actual utilization scale for trees ranging from 12 to 20 inches in d.b.h.

In accordance with this finding the yield 50 years hence was computed by the International table and reduced by 28%.

WESTERN YELLOW PINE - YOUNG TIMBER

COMPARISON OF

Scribner Dec. C and International (1/4-inch kerf) Log Rules

Curved Values

	Diameter Breast High Inches					
	12	14	16	18	20	Av. 11-20"
Scribner Dec. C scale of material in tree actually utilized in woods	102	137	204	300	352	204
Scribner Dec. C scale of material in tree if utilized to 6" top diameter inside bark	107	147	214	310	365	211
Per cent gained by scaling tree to 6" top diameter inside bark over actual utilization scale. Scribner Dec. C. rule	4.9	7.3	4.9	3.3	3.7	3.4
Scale of material in tree actually utilized by International rule	122	167	251	367	417	247
Per cent gained by scaling material actually utilized with International rule over actual utilization scale, Scribner Dec. C rule	19.6	21.9	23.1	22.3	18.5	21.1
Scale of material in tree by International rule if utilized to 4" top diameter inside bark	134	192	265	382	454	261
Per cent gained by scaling tree to 4" top diameter inside bark by International rule over actual utilization scale Scribner Dec. C rule	31.4	40.2	29.9	27.3	23.3	27.9

Lumber Census

Returns were secured from about twenty mills which had not been heard from at the end of May, and the last of the schedules for both Idaho and Montana have been mailed to the Forester.

The 1930 lumber production figures resulting from a summarization of the R-1 tabulation sheets are as follows:

Lumber Cut - M Ft. B.M.

(Mills cutting less than 50M during year excluded)

Species	Idaho	Montana	Combined Cut Volume	Per Cent
Idaho white pine	432,440	25,601	458,041	40.3
Western yellow pine	219,969	133,730	353,699	31.1
Western larch	56,284	77,889	134,173	11.8
Douglas fir	61,087	45,558	106,645	9.4
White fir	53,116	70	53,186	4.7
Spruce	7,970	13,343	21,313	1.9
Cedar	7,612	0	7,612	0.7
Lodgepole pine	1,017	764	1,781	0.1
Hemlock	332	0	332	-
Cottonwood	650	19	669	-
Total	840,477	296,974	1,137,451	100.0
Lath M pcs.	84,106	14,483		
Shingles, M pcs.	4,940	25		

Idaho and Montana mills cutting less than 50 M produced 2,606 M feet in addition to the above combined total. There were 55 mills in Idaho and 54 mills in Montana which produced less than 50 M feet. Including these small mills, the 1930 aggregate was 841,738 M feet in Idaho and 298,319 M feet in Montana.

In comparison with the 1929 cut of all mills producing 50 M feet and over, the 1930 totals show a decrease in production amounting to 18.4% for Idaho and 23.5% for Montana.

Average Mills Run Prices	Annual, 1930	1st Q., 1931	April, 1931	May, 1931
Idaho White Pine	$35.56	$31.41	$30.63	$31.91
Western Yellow Pine	21.64	19.25	19.95	19.50
Larch-fir	17.32	14.26	12.95	13.81
White fir	16.34	13.76	13.92	13.58
Spruce	21.93	18.39	19.26	19.29

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FOREST TAXATION INQUIRY

The only field work during May & June was conducted in Europe by Fairchild and Hall. They returned to the office June 11 after a two months' trip, in which they visited the countries of Germany, Sweden, Finland, and France. They succeeded in filling in the more important gaps in the Inquiry's information about the taxation of forest lands in those countries. They also obtained rather complete details in regard to the taxation, income, and valuation of a number of private forests in the same countries, which will serve as examples to illustrate and explain the workings of the tax laws as actually applied to forest properties.

A progress report dealing with taxation as related to the forest industries in the Pacific Northwest, the data for which were obtained with the cooperation of the timberland owners and operators, was submitted in advance of publication to the Pacific Northwest Forest Experiment Station and through the Station to a number of key men in the forest industries who are interested in the project. In this way a number of valuable suggestions were received, and the report will soon be revised for publication.

A number of chapters of the comprehensive report have been written in tentative form and are now being studied by the staff. A general conference has been held in which the conclusions as to the recommended solution of the forest tax problem were discussed. Work on the comprehensive report, together with review of the progress reports now being prepared for publication, absorbed most of the time of the staff during the last half of June.

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